MicroBooNE PMT Internal Review: Cost & Schedule, WBS 1.8.5
Answers to the Charge
January 21, 2011

1. **Will the PMT support system meet the needs of the PMT detectors and integrate smoothly with other elements of the experiment?**

   The PMT support rack has been designed in a coordinated effort by mechanical engineer Bill Sands, Princeton, and Tess Smidt, MIT, in order to ensure that it a) meets the requirements of the PMT group, and b) is consistent with the engineering constraints of the cryostat, cryogenics, and all other elements of the MicroBooNE project.

2. **Have the interfaces with the cryostat and with the electronics systems been agreed to with the other subsystems?**

   Since July, the PMT group has utilized the Interface Agreement format developed by MicroBooNE project management to formalize interfaces between Installation, Cryostat, and Electronics WBSs. The Installation interface (DocDB #1198) has received approval by both L-2 Managers as well as Randy. The Electronics interface (DocDB #1202) is in the final stages of agreement and will be sent to Randy for approval after a final discussion between both WBSs at the Active Detector Working Group meeting on 1.27.11. The Cryostat interface (DocDB #1204) has been initiated and is in the process of iteration by both L-2 Managers, and will be submitted to Randy for final approval before the end of January.

3. **Are there assembly and insertion plans that are well thought out and minimize risk to the experiment?**

   Assembly and insertion plans have been carefully developed in a coordinated effort in order to satisfy constraints of the Cryostat, accommodate the Cryogenics and TPC structures already present in the vessel at the time of installation, and preserve the integrity of the PMT system. All of the details of these insertion plans are documented in the Installation and Cryostat interfaces, mentioned above.

4. **Are the future manpower needs sufficient and identified? Are all manpower/materials costs identified in the BoEs and resource-loaded schedule?**

   Manpower needs for the remaining tasks to completion are all clearly identified. They primarily consist of MIT graduate student and post doc labor, as well as nominal time from technicians from Fermilab PAB and EED, Nevis machine shop workers, and Princeton machine shop workers. All materials still to be purchased are itemized in the "Total Remaining Purchases" document (DocDB # 1200), where manpower is itemized as well. This information is also in the RLS schedule, from which BoEs can be directly extracted.

5. **EVMS, as performed by the on-Project WBS (tracking of dollars), is not required for this system, but monthly progress reports and status of the tasks in the WBS remains. Are there sufficient milestones embedded among the tasks to allow for sufficient progress tracking on a month-to-month basis?**

In the course of the fall, the PMT project management has worked with the previous WBS 1.8 schedule and refined it to include detail on each WBS, dividing all tasks into projects that can be monitored for completion on, at maximum, a month-to-month basis. This enables ample tracking of the PMT system alongside other elements of MicroBooNE as the project nears completion, even though WBS 1.8 does not require additional EVMS.

6. Does the subsystem have all of the necessary CD-2 documentation completed?

The PMT group has completed and submitted their chapter of the TDR to MicroBooNE for review. In addition, Interface Agreement forms are in the DocDB. The schedule is updated with milestones and information on resources and manpower. The subsystem is well ahead of the critical path, and funding utilizes off-project dollars, which eliminates the need for EVMS documentation. The L-2 Manager is available to complete any remaining documentation requisite for CD-2.